How To Make a Perfect Mix . . .

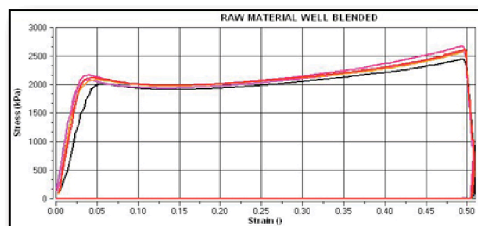
Mixing and blending are done daily for thousands, if not millions, of products all over the world. When is mixing complete? When are products thoroughly blended? For many products this is not a critical decision, but for some others it can mean the difference between an acceptable product and an unacceptable one.

One of our recent customers is a case in point. The product was a specially formulated wax for a medical equipment application. Several ingredients are mixed with a combination of waxes to form small beads. This becomes the raw material product. In one process a few beads are melted and poured into a small mold, in another process a few beads are melted an used as a potting material. In either case, so few beads are used because each must be chemically identical. The physical properties of this wax are critical to its performance, and those properties can be affected by a number of factors including insufficient mixing before the beads are formed.

A method for proving satisfactory properties of each batch of beads was sought. The solution turned out to be quite simple. A small mold was made which could form five 8mm x 8mm wax cylinders. This provided five samples for testing each batch of beads.

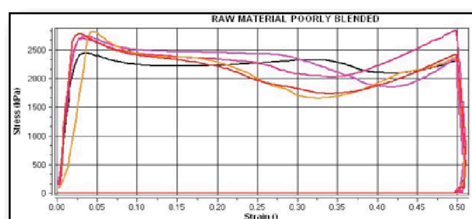
Brookfield CT3 Texture Analyzer

The test consisted of using a Brookfield CT3 Texture Analyzer to compress each cylinder to 50% of its original length while monitoring the force response. The two accompanying graphs show stress-strain force response for five replicate tests of well blended material and five tests of poorly blended material.



Raw Material Well Blended

Looking at the well-blended graph we see the average hardness of the cylinders is 2000-2200 kPa. At this force the cylinder begins compressing. While the wax cylinder is being compressed the force curve is smooth and gradually increasing as the cylinder diameter increases. When the test is over the cylinder has become a thick disk, but is still in one piece.



Raw Material Poorly Blended

Looking at the poorly blended graph we see that these cylinders were slightly harder, 2400 - 2800kPa. As these cylinders are compressed we see significant differences in the force curves as the cylinders splintered and fractured. At the end of the tests each cylinder was broken into multiple pieces.

The stress-strain test results can predict satisfactory physical properties of each batch on the day of manufacture, ensuring proper performance for the customer.

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